

CLAIMS

1. A method of manufacturing an optical integrator panel (17), the method comprising the steps of:
 - suspending a plurality of elongate particles (21) in a liquid;
 - applying a electric or magnetic field to the suspension (19) to orientate the particles with parallel longitudinal axes; and
 - solidifying the liquid to fix the orientation of the particles, thereby forming an optical integrator panel having a homogeneous distribution of elongate particles.
2. The method of claim 1, further comprising the step of bringing the suspension between two parallel substrates prior to the step of applying the electric or magnetic field.
3. The method of claim 2, wherein the substrates are coated with electrically conductive electrodes, and wherein at least one of the substrates and its respective electrode are at least partially transparent to ultraviolet light.
4. The method of any one of the preceding claims, wherein ratio between thickness and length of the elongate particles is at least 1:10.
5. The method of any one of the preceding claims, wherein the elongate particles have reflective surfaces.
6. The method of claim 5, wherein the elongate particles comprise multiple layer dielectric materials.
7. The method of any one of the preceding claims, wherein the thickness of the elongate particles is in the range 5nm to 1 μ m and the length of the elongate particles is in the range 1 μ m to 50 μ m.

8. The method of any one of the preceding claims, wherein the liquid becomes a flexible transparent solid after solidification.

9. The method of any one of the preceding claims, wherein the liquid comprises a polymerisable liquid, and the step of solidifying the liquid comprises polymerising the liquid.

10. The method of any one of claims 1 to 8, wherein the liquid comprises an organic material having a solidifying temperature above 40°C, and the step of solidifying the liquid comprises cooling the liquid.

11. The method of claim 9, wherein the step of polymerising the liquid comprises initiating a polymerisation reaction by exposing the polymerisable liquid to ultraviolet light or heat.

12. The method of claim 11, wherein the polymerisable liquid comprises a metha(acrylate) monomer, an epoxy, a vinyl ether monomer or a thiolene system.

13. The method of any one of the preceding claims, wherein the suspension has a concentration of elongate particles by weight of less than 1%.

14. The method of claim 2, wherein the longitudinal axes of the elongate particles are orientated to be perpendicular to the substrates.

15. An optical integrator panel (17) having a homogeneous distribution of elongate particles (21), the optical integrator panel and according to the method of any one of claims 1 to 14.

16. An optical integrator panel (17) adapted to reduce the angular dependence of contrast of a liquid crystal display, the optical integrator panel

being for placement in the path of reflected or transmitted light emitted by the liquid crystal display.

17. The optical integrator panel of claim 16 comprising:
a solid transparent panel; and
a plurality of elongate particles (21) homogeneously distributed in the panel, wherein the plurality of elongate particles are orientated with parallel longitudinal axes.

18. The optical integrator panel of claim 17, wherein the ratio between thickness and length of the elongate particles is at least 1:10.

19. The optical integrator panel of claim 17 or 18, wherein the surfaces of the elongate particles are reflective.

20. The optical integrator panel of any one of claims 17 to 19, wherein the thickness of the elongate particles is in the range 5nm to 1 μ m and the length of the elongate particles is in the range 1 μ m to 50 μ m.

21. The optical integrator panel of any one of claims 17 to 20 having a concentration of elongate particles by weight of less than 1%.

22. The optical integrator panel of any one of claims 17 to 21, wherein the longitudinal axes of the elongate particles are orientated to be perpendicular to the surfaces (23) of the optical integrator panel.

23. A liquid crystal display device (47) comprising the optical integrator panel of any one of claims 15 to 22.

24. The liquid crystal display device of claim 23, wherein the optical integrator panel is positioned adjacent one of two substrates (55, 57) between which liquid crystals (49) are held.

25. Use of the optical integrator panel (17) of any one of claims 15 to 22 for reducing the angular dependence of contrast of a liquid crystal display.

26. An optical integrator panel (17) comprising:
one of a transparent cured metha(acrylate) panel, a transparent cured epoxy panel, a transparent cured vinylether monomer panel and a transparent cured thiolene system panel; and
a plurality of elongate particles (21) homogeneously distributed in the panel, wherein the plurality of elongate particles are orientated with parallel longitudinal axes.